Trough Power Systems with Direct Steam Generation

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Approach

- Direct Solar Steam Generation avoiding a secondary heat carrier in the collector
- 500 m parabolic trough test loop at PSA
- Aperture: 5,78 m
- up to 100 bar/400°C

Objective:

15% cost reduction for the solar field

15% more energy output

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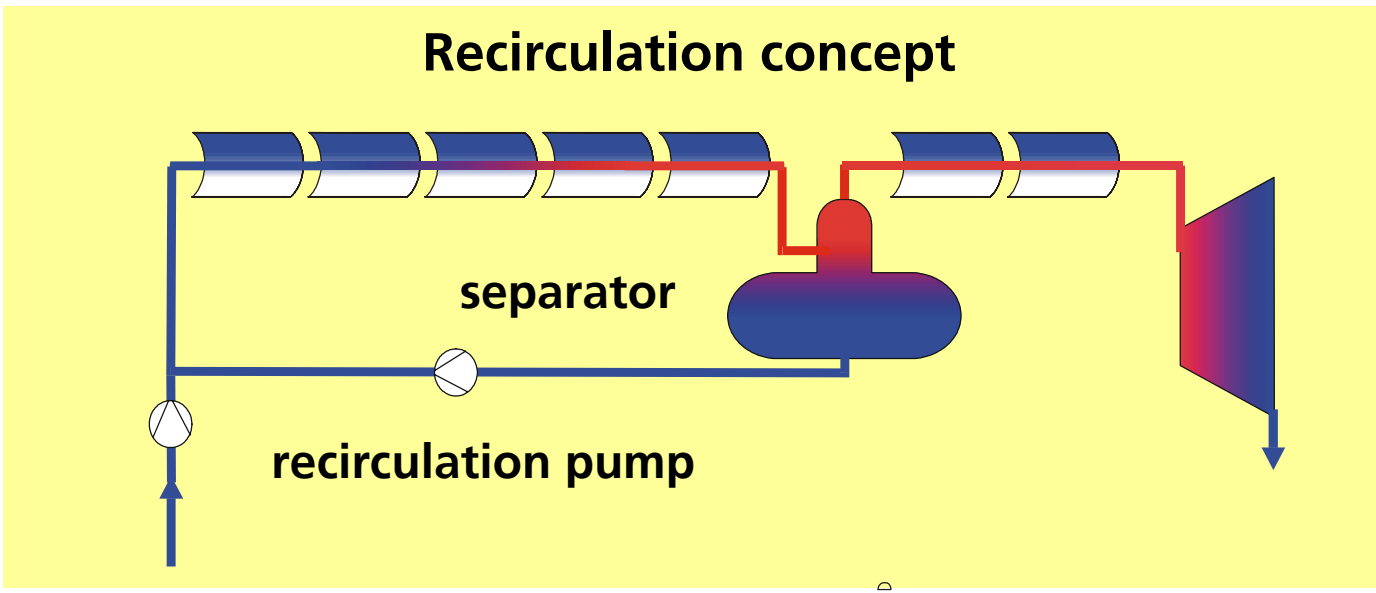
DSG Trough Power Systems

Status

- Feasibility of DSG has been proven during European DISS project
- European project INDITEP 2002-2004/5

Integration into conventional power plant
Development of 5 MW_e pre-commercial plant
Improvement of solar specific components

- Absorber
- Separator
- Buffer storage



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Storage for DSG Trough Power Systems

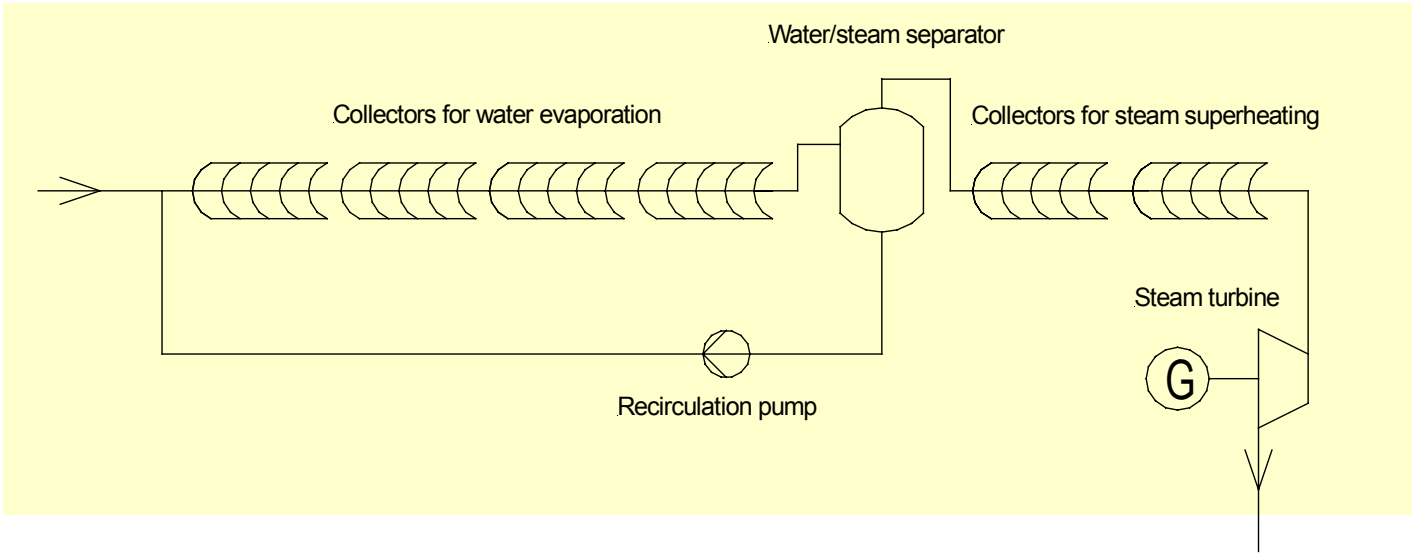
Status

Actually NO proven - economic and reliable - storage technology available

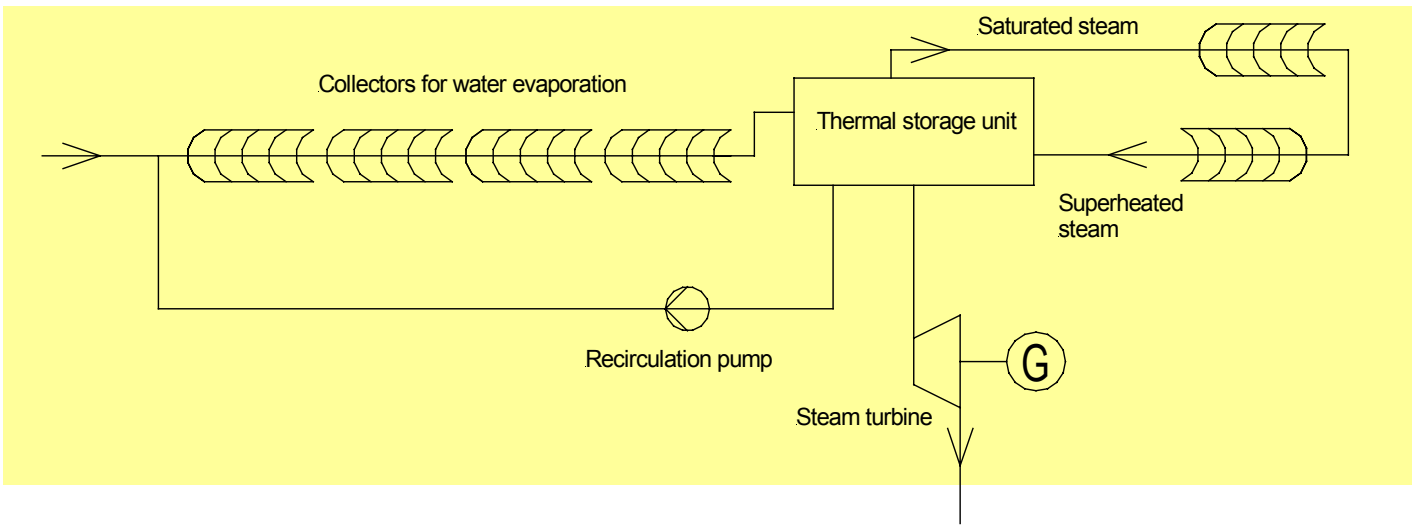
Approach

- **PCM storage**
- **Steam storage**

Storage for DSG Trough Power Systems



Basic operation concept



Storage integration concept

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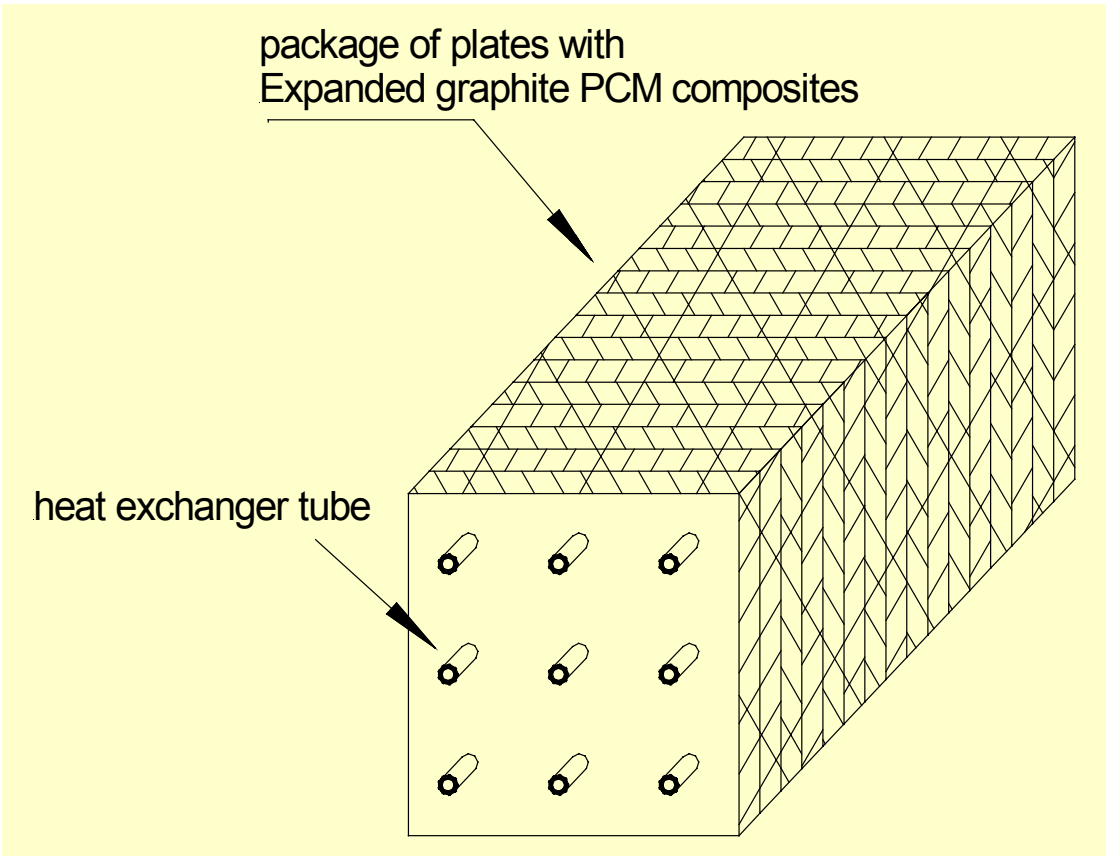
Storage for DSG Trough Power Systems

EG- PCM External Arrangement Approach



Micro encapsulated PCM in high thermal conductivity expanded graphite

Sheets /plates of EG-PCM composite

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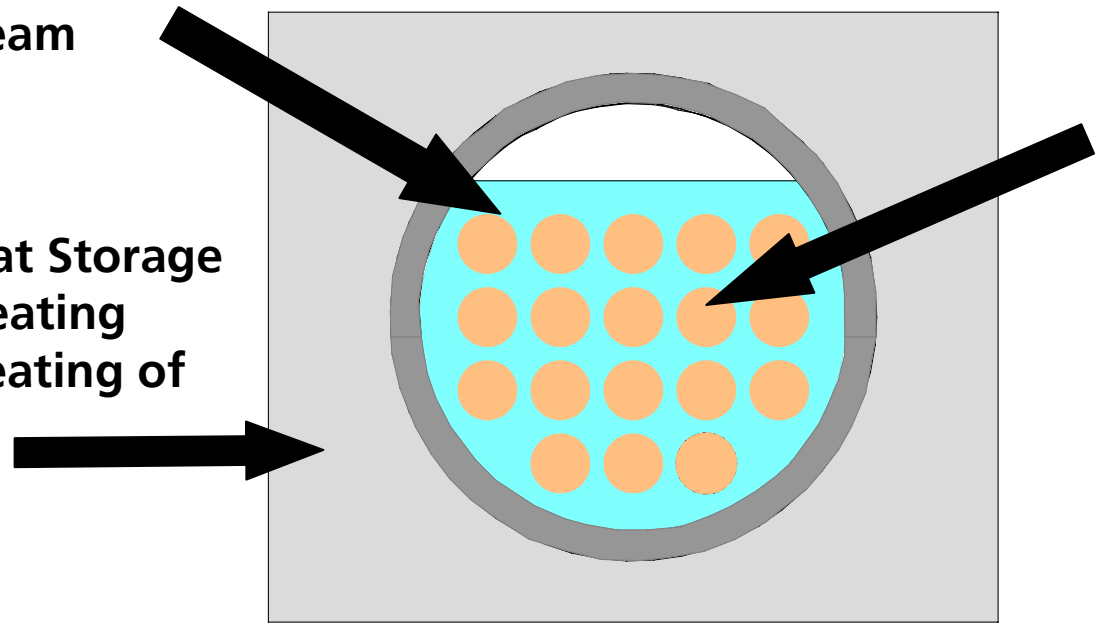
Storage for DSG Trough Power Systems

PCM Macro Encapsulation Approach

PCM Storage for Evaporation/Condensation of Water/Steam

Packed bed arrangement of EG-PCM composite encapsulated in small containment

Sensible Heat Storage for water heating and superheating of steam



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Proposal to EC FWP 6 - Deadline 18th of March

Energy Storage for Direct Steam Solar Power Plants - DISTOR

6.1.3.2.3. New and advanced concepts in renewable energy technologies
STREP in the area "Concentrated solar thermal

Objectives and main deliverables

- Development of advanced storage materials based on PCM technology
- Identification of adjusted design by lab scale testing
- Material and design verification for DSG technology by testing of 200kWh storage modules in the existing DISS loop at the PSA in Spain
- Identification of the most promising storage technology to achieve the long-term target for DSP storage technology
  - efficiency of more than 90%,
  - specific investment cost of less than 20€/kWh thermal capacity
  - modular storage design and flexible scale of storage capacity

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Energy Storage for Direct Steam Solar Power Plants - DISTOR

Innovative Approach

- New Expanded graphite PCM composite resulting in improved heat conductivity, long term stability, negligible volume change and mechanical stress
- phase change thermal storage with reflux heat transfer - RHTS concept

Work Programme

WP 1	Definition phase
WP 2	Advanced PCM development
WP 3	Development of adapted PCM storage design
WP4	Validation of PCM storage materials and adapted storage design
WP 5	Storage integration strategy

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Proposal to EC FWP 6 - Deadline 18th of March

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Consortium (preliminary status)

Contractor	Nationality	TYPE	CC/SME
CNRS	F	RES	
Uni Bord	F	HE	
EPSILON	F	IND	
DEFI	F	IND	SME
DLR	D	RES	
SGL	D	IND	
FSI	D	IND	SME
CIEMAT	E	RES	
INASMET	E	RES	
SOLUCAR	E	IND	
SISCALOR	E	IND	SME
Iberdrola	E	IND	
WIS	IL	HE	
BAS	Bulg	HE	CC

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